EPA Region 5 Records Ctr.
378978

Long-Term Monitoring Plan
Former Nutting Truck and Caster Company Site
Faribault, Minnesota

Prepared for
Prairie Avenue Leasing

Revised June 2004

BARR

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1.0 Introduction

Barr Engineering Company (Barr) was retained to prepare the Long-term Monitoring Plan (Monitoring Plan) for the Prairie Avenue Leasing Company (formerly known as the Nutting Truck and Caster Company) site in Faribault, Minnesota (Site). The Monitoring Plan is prepared in support of a request to delete this Site from the Minnesota Pollution Control Agency's (MPCA's) Permanent List of Priorities and the U.S Environmental Protection Agency's (USEPA's) National Priorities List (NPL) and to close the Site. The objectives of the plan are to:

- Provide a sample collection and analysis plan for the Site to be implemented during periods when the pump-out system is operating.
- Provide a sample collection and analysis plan to evaluate plume stability when the pump-out system is off.
- Provide a contingency plan for turning the pumps back on should the water quality data indicate that VOC concentrations are increasing and may become a threat to human health.

1.1 Background

The Site is located in Faribault, Minnesota and Figure 1 shows the property location. In 1987, the U.S. EPA and MPCA approved the Response Action Plan (RAP) for groundwater remediation at the Site, and a pump-and-treat system was installed. The pump-out wells (PW17 and PW 18) are operated under the Department of Natural Resources water appropriations permit number 875051. The effluent from wells PW17 and PW18 flows to vented manhole "A" and to the stormwater catch basin at Lincoln Avenue and Division Street. From the catch basin, the discharge flows three blocks to the discharge point at Crocker's Creek. Discharge of the water from the pump-out wells into Crocker's Creek is regulated under the National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit Program (Permit No. MN0057541).

Groundwater samples have been collected at the Site in accordance with the monitoring plan included in the RAP (Barr, 1987) and the revisions that were approved on September 22, 1987. Surface water samples have been collected in accordance with NPDES/SDS Permit MN0057541. Since 1996, groundwater and surface water samples have been collected in accordance with the Revised Monitoring Plan (Barr, 1996), and samples have been collected annually in May since January 17, 1992 when the MPCA proposed that the monitoring frequency be reduced. NPDES/SDS permit monitoring (NPDES permit issued September 2000) is also performed annually in the second quarter.

The property map on Figure 2 shows the monitoring wells at the Site.

1.2 Applicable Criteria

The pump-out system is designed to mitigate site-related risks to human health and the environment and to mitigate groundwater degradation. TCE is the primary contaminant of concern in the groundwater. Water quality data can be compared to the following ARARs to evaluate the effectiveness of the remedy.

- Minnesota Rules Chapter 4717 regulates the Minnesota Department of Health's Health Risk Limits (HRL). HRL are health-based, contaminant-specific reference concentrations that are considered to be protective of human health.
- Minnesota Rule 7060. The goal of groundwater remedial actions is to manage groundwater contamination in a manner which prevents further degradation of aquifers.
- National Pollution Discharge Elimination Permit. All discharges to Crocker Creek must meet the water quality standards in Permit Number 0057541.
- Minnesota Rules Chapter 7050 regulates discharges to a surface water body. The discharge standards in the NPDES permit must be consistent with these regulations.
- Minnesota Rule Chapter 4725 relates well construction and repair. All wells included in the long-term monitoring plan must be installed and are maintained in conformance with the Minnesota Well Code.

The active pump-out system and monitoring plan described in the Certificate of Completion Report has successfully met all of the ARARs downgradient of pump-out wells PW17 and PW18 (Barr, 2003a). TCE concentrations in downgradient sentinel monitoring wells B8, B12, and W14 samples have been less than the detection limit (typically less than 1 µg/L) in 74 of the 82 samples collected from this set of wells from 1987 through 2003. TCE concentrations in the eight samples with concentrations greater than the detection limit were all reported at levels less than 1.0 µg/L.

Since the pump-out system became operational in 1987, concentrations of volatile organic compounds (VOCs) in the groundwater have steadily decreased. TCE concentrations in samples from glacial drift monitoring well B15 and pump-out wells PW17 (St. Peter Sandstone) and PW18 (glacial drift) have not exceeded 50 µg/L since 1988. The average TCE concentrations in samples from glacial drift wells B15 and PW18 have been 9.7 µg/L and 8.5 µg/L, respectively, for the past five years. The average TCE concentration in samples from St. Peter Sandstone pump-out well

PW17 has been 4.0 µg/L for the past five years. During the past three years, a root mat has developed at and above the water table inside the casing for Well B15. The root mat was removed in 2003, but it grew back again in 2004. Well B15 will be removed from the monitoring network due to the persistent presence of roots growing within the casing above the water table. This well will be permanently sealed. This well is not needed for the Tier 2 monitoring program since the TCE concentrations in samples from wells B15 and PW18 have been similar for at least the past five years.

In 1993, the TCE concentration in the sample from source well B4 was 20 µg/L, the lowest TCE concentration measured in samples from this well. TCE concentrations in samples from monitoring well B4 increased to a high of 350 µg/L in the June 1999 sample. Since then TCE concentrations have declined again, and the TCE concentration in the most recently collected sample (May 2004) was reported at 35 µg/L. A periodic spike in VOC concentrations in samples collected near the source area is typical and likely due to a temporary change in the transport rate of TCE from sediment to the groundwater.

Review of the existing data suggests that biological attenuation of TCE concentrations in the aquifer is not contributing significantly to the decline of VOCs in the aquifer. This conclusion is based on the following observations:

- Concentrations of TCE in the groundwater near the source, and downgradient from it, are too low to support microorganisms;
- Daughter products, 1,1-dichloroethylene and 1,2-dicchloroethylene, are typically reported as not detected or at concentrations less than 1 per cent (approximate concentration of dichloroethylene compounds in TCE products) of the TCE concentration;
- Daughter product, vinyl chloride, has never been detected in any samples from wells at this site and was not detected in the most recently collected sample (May 12, 2004) at a detection limit of 0.2 µg/L; and
- No carbon source to support biological activity has been identified.

Advection and dispersion are likely to be the primary factors responsible for the reduction in VOC concentrations. Discontinuing pumping of wells PW17 and PW18 is not expected to negatively affect downgradient water quality based on the persistently low TCE concentrations in samples from

the pump-out wells and monitoring well B15, and the trace (<1.0 µg/L) to nondetectable TCE concentrations in samples from the sentinel wells.

2.0 Monitoring Plan

The groundwater monitoring plan is presented as a two-tier program to meet two different objectives. The Tier 1 program, which is currently used to monitor the response action, will be implemented during periods when the groundwater pump-out system is active. The Tier 2 program is designed to provide data needed to evaluate the affect of turning off the pump-out system at wells PW17 and PW18 on downgradient groundwater quality.

2.1 Tier 1 Monitoring Plan

While the groundwater pump-out system is active, groundwater and surface water monitoring will be performed annually. The monitoring plan is summarized in Table 1, and sample locations are shown on Figure 2. Samples will be collected annually from wells B4, B8, B12, W13, W14, PW17, and PW18 and analyzed by a Minnesota Department of Health (MDH) certified laboratory.

The laboratory will analyze the samples for the VOC parameters listed in Table 2 by Method 8260.

2.1.1 NPDES Monitoring Plan

Groundwater from the pump-out wells is discharged to the storm sewer system via a manhole at the intersection of Lincoln Avenue and Division Street. From the manhole, the storm sewer runs three blocks to the NPDES discharge point at Crocker's Creek.

Surface water monitoring locations include the final effluent at Crocker's Creek and at the Outfall 20100 (catch basin at Lincoln and Division). Surface water samples are collected and analyzed according to the schedule and requirements of the NPDES/SDS permit (MPCA 2000). Table 1 presents a summary of monitoring requirements and Figure 2 presents the sampling locations.

2.2 Tier 2 Monitoring Plan

Operation of the pump-out system will be discontinued to evaluate the plume stability. During this evaluation period, the Tier 2 monitoring plan will be followed. Groundwater samples will be collected semiannually from monitoring wells B4, B8, B12, W13, W14, PW17 and PW18. Tier 2 monitoring is expected to be performed for six years. Recommendations for changes to the monitoring plan regarding wells, frequency and length of time for monitoring will be made as needed

in the semiannual monitoring reports. The monitoring well network will be divided into three groups:

- Wells B8, B12, and W14 will comprise the downgradient compliance wells or sentinel wells.
- Wells B4 and W13 will be used to monitor water quality conditions in the source area.
- Wells PW17 and PW18 will be used to evaluate aquifer conditions in the vicinity of the pump-out wells.

Table 1 presents a summary of the monitoring plan, and sampling locations are shown on Figure 2. All samples will be analyzed by a MDH-certified laboratory. Samples will be analyzed for the following four contaminants of concern (COCs): 1,1-dichloroethylene, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, and TCE. These are the only VOCs that have been detected regularly in the Site well samples. Samples will be analyzed by Legend Technical Services in St. Paul, MN by EPA Method 8260.

NPDES monitoring will not be performed while the pump-out wells are off.

2.3 Tier 2 Monitoring Contingency Plan

During Tier 2 monitoring, water quality data will be evaluated semiannually. The non-parametric Mann-Kendall test will be used to determine if the water quality data meets the criteria required for site closure. The statistical test is described in detail following the list of criteria. If the data indicate that criteria for closure are not being met, then the pumps in wells PW17 and PW18 will be restarted and Tier 1 monitoring will be resumed. The following describes the criteria for closure for two groups of wells:

- TCE concentrations in samples from pump-out wells PW17 and PW18 will decrease, remain stable, or show no trend.
- Concentrations of four COCs in samples from sentinel wells B8, B12 and W14 will remain below their respective HRL. If COCs are detected in the samples from these wells, the trends in COC concentrations will be either stable, decreasing or there will be no trend.

The non-parametric Mann-Kendall test, as adapted by Air Force Center for Environmental Excellence, will be used to evaluate water quality data trends. The Mann-Kendall test is a non-

parametric test used to determine if sequential data points show any correlation. The Air Force Center for Environmental Excellence, Monitoring and Remediation Optimization Software (MAROS) uses a modified version of the Mann Kendall to evaluate trends in groundwater quality. Table 3 presents the MAROS decision matrix.

In the trend analyses, non-detects will be treated as zero values. When duplicate data are available, VOC concentrations detected in the sample will be used, unless the data from the duplicate sample indicate that the data are not valid. In this case, a new sample will be collected and analyzed.

The procedure involves first calculating the Kendall statistics via a spreadsheet. The Kendall statistics give the direction of the trend, (either positive, negative or zero) and a confidence level for the trend. The trend direction is based on the number of times a sample concentration is higher or lower that the preceding datum. The tabulated results yield a trend direction. The confidence is the probability that the trend is not the result of random variation in the data. The Mann-Kendall test is non-parametric since it gives the direction but not the magnitude of the trend.

After the trend direction and confidence are determined, the MAROS decision matrix, shown on Table 3, is used to draw a conclusion regarding the trend. Where there is a high confidence in the trend (e.g. > 95%), the MAROS decision matrix concludes the trend is definite. For the lower confidence (e.g. >90%), the MAROS decision matrix concludes the trend is "probably" true. For a confidence interval <90 percent, the MAROS decision matrix concludes that either there is no trend or the data are stable. At these low confidence levels the coefficient of variance of the data set is used to distinguish between no trend and a stable trend in cases where there is a low confidence (<90%). A variance of less than 1 indicates the data are relatively close together, indicating stability over time. A variance of greater than 1 indicates scatter in the data and consequently no trend.

Data analysis using the Mann-Kendal approach will be applied to analytical data collected from the most recent eight years. If TCE concentrations in samples from wells PW17 and PW18 show an upward trend at a 90 percent confidence interval, or COC concentrations in samples from the sentinel wells increase to within 50 percent of the HRL for any single parameter, then the monitoring plan will be reviewed, sample frequency may be increased, or pumping may be resumed. If data analysis concludes that there is a 95 percent probability that TCE concentrations are increasing in samples from PW17 and PW18 or COC concentrations in samples from sentinel wells are increasing to 50 to 75 percent of the HRL, Tier 1 monitoring and operation of the pump-out wells will be resumed.

2.4 Criteria for Closing the Groundwater Pump-Out System and Discontinuing Monitoring

The estimated average groundwater flow velocity is 200 to 350 feet per year based on the following assumptions and field data:

K =	0.015 cm/sec - 0.025 cm/sec
I =	0.003 feet/foot
n =	0.2

With an average velocity of 200 to 350 feet per year, contaminants in the area of the pump-out wells should reach wells B8, B12 and W14 within three years. Based on this analysis, the Tier 2 monitoring program should include a minimum of three years of semiannual monitoring. Recommendations to change the monitoring frequency may be made after three years. It is expected that monitoring will continue for six years unless COC concentrations decrease significantly in the first few years or concentrations increase and Tier 1 monitoring is resumed.

If water quality data for samples from the downgradient compliance wells meet the requirements of the consent order, ARARs and VOC concentrations in wells PW 17, PW18, B8, B12, and W14 are stable or decreasing, the Site will be closed and the MPCA will issue a Certificate of Completion to Prairie Avenue Leasing for the groundwater remedy.

3.0 Groundwater Sampling Procedures

All groundwater sampling proeedures will be performed in accordance with MPCA requirements and Barr Engineering's standard operating procedures (SOPs). Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results and descriptive text relaying documentation of all field activities, including measurements and instrument calibrations.

3.1 Well Purging

Monitoring wells will be purged prior to sampling using a bladder pump, submersible or whale pump, peristaltic pump, or bailer. Pump inlets and bailers will be constructed of stainless steel and/or Teflon. Pumps and bailers will be equipped with check valves to prevent water from reentering the well. Monitoring wells B4, B8, B12, W13, and W14 will be purged following the methods in section 3.1.1 and wells PW17 and PW18 will be purged by micro-purging techniques described in section 3.1.2.

3.1.1 Wells B4, B8, B12, W13 and W14

The rate of pumping at wells B4, B8, B12, W13, and W14 will not exceed 1 gallon per minute (gpm). A stabilization test will be conducted on each monitoring well during purging. Stabilization is achieved when specific conductance (temperature corrected), pH, and temperature show three consecutive equivalent values within plus or minus 5%.

A minimum of three and a maximum of five well volumes will be removed from wells B4, B8, B12, W13, and W14 during purging.

Prior to well purging and sampling, the depth to water from the top of the riser pipe will be measured to the nearest 0.01 foot with an electronic water level indicator.

The groundwater monitoring wells will be sampled in order from clean to dirty.

3.1.2 Wells PW17 and PW18

Low-flow purging techniques will be used at wells PW17 and PW18 due to the wells having 8-inch diameter screens. During the first round of sample collection, the purge rate for each well and the sample collection depth for St. Peter well PW17 will be determined. At both wells, the groundwater

will be purged at about 2 gpm to prevent drawdown in the well. A water level indicator will be monitored during well purging to determine the appropriate flow rate. This will minimize the amount of water pumped from the well and allow for water to flow horizontally from the aquifer into the well. Approximately 8 gallons (equal to three volumes of water in a 1-foot screened interval) of water will be removed during the purging and stabilization process. The pumping rate will be reduced after the water meets stabilization criteria and samples will be collected directly from the pump.

The purge pump will be placed in glacial drift well PW18 five feet above the bottom of the well. In St. Peter well PW17, the purge depth will be determined during the first round of Tier 2 monitoring. During the first round of Tier 2 monitoring, samples will be collected 5 feet below the top of the screen (6 feet below the top of the St. Peter Sandstone and 48 feet below ground surface). A second sample will be collected 6 feet above bottom of the well (3 feet above the basal St. Peter Sandstone and 68 feet below ground surface. Both samples will be analyzed for the VOCs in Table 2. During future monitoring events samples from well PW17 will be collected at the depth were VOC concentrations were the highest unless the concentrations were the same at both depths, in which case the shallower depth will be point where future samples will be collected.

3.2 Sample Collection

Samples will be collected from the monitoring wells using a bailer with stainless steel retrieval wire. The wire will be stored on a spool (down rigger) to prevent contact with the ground. The bailer will be carefully lowered into the wells, and samples will be collected from a consistent depth below the water surface. Samples from pump-out wells PW17 and PW18 will be collected from the purge pump.

Sample containers for VOC analyses will be collected with minimal aeration, and no headspace will be left in the sample vial following capping. If headspace is found in the vial, the vial will be discarded and a replacement will be collected.

Surface water sampling for NPDES monitoring requirements under the Tier 1 program will follow the SOP for surface water sample collection.

4.0 Analytical Procedures

Legend Technical Services, Inc. in St. Paul, Minnesota or another MDH-certified laboratory will analyze project samples by method 8260. Sandy McDonald will be responsible for the project management at the laboratory. Legend is a MDH state-certified laboratory and has a QA/QC manual on file with the MPCA. Samples will be analyzed according to the methods and reporting limits given in Table 2.

5.0 Project-Specific Quality Assurance Procedures

5.1 Introduction

This section of the monitoring plan provides the project-specific QA/QC procedures to be followed during all sampling and analysis.

5.2 Data Quality Objectives

Data quality objective (DQO) planning steps are designed to ensure that the type, quality, and quantity of environmental data used in decision-making are appropriate for the intended application. Three site DQOs have been identified and are presented below:

1. To verify that groundwater quality is degrading in the vicinity of source wells (B4 and W13). Data from well B4 and W13 will provide information regarding changes in source strength.

2. To verify that the plume will not migrate beyond the compliance wells B8, B12, and W14 at concentrations which will exceed the associated ARARs described above.

3. To evaluate water quality in the vicinity of the pump-and-treat system (pump-out wells PW17 and PW18). Data from these wells will be used to evaluate changes in groundwater quality downgradient of the source area.

The data and information generated during the monitoring will be used to evaluate the effectiveness of the ongoing monitoring programs. The data must satisfy the objectives presented below:

1. Analytical results for groundwater samples must accurately reflect the site groundwater. Chemical analyses of the groundwater (both field and laboratory) will be performed to confirm the levels of chemical constituents present in the groundwater. Quality control samples will be collected to ensure the monitoring well samples are representative.

2. Analytical results must satisfy quality control requirements including: QC requirements for accuracy, precision, representativeness, completeness and comparability.

4. Field analysis data quality will require an intermediate level of data quality and will be used for general chemistry compounds and well stabilization. Field and trip blanks will be analyzed to verify the sampling is not adversely affecting the data. Calibration and blank

information will be used to verify the field results are representative and not adversely affecting the data.

5. The laboratory analysis of groundwater samples will require a high level of data quality and are characterized by rigorous QA/QC protocols and documentation and will provide qualitative and quantitative data. Analytical procedures must be in accordance with State-recognized protocols.

5.2.1 *Laboratory Deliverables*

Laboratories can report data in several levels of detail of supporting information. Sample data reported from the laboratory for this site will consist of client-specific QC samples (matrix spike and matrix spike duplicates) and laboratory control sample results, laboratory method blank results, and surrogate standard recoveries results.

5.2.2 Data Review

Data review procedures will be performed for both field and laboratory operations.

Data review procedures are based on U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Validation, (EPA 1999, 2000). The standard operating procedure for data review is provided in Appendix B.

The Barr QA manager will conduct a systematic review of the data for compliance with the established QC criteria based on the QC results provided by the laboratory. The technical holding times, results of all blanks, surrogate spikes, matrix spikes/matrix spike duplicates, laboratory control samples results will be reviewed. The Barr QA manager will also conduct a review of the field data ensuring that field instrumentation and proper protocols were used. One hundred percent of the data will be reviewed.

The data reviewer will identify any out-of-control data points and data omissions and interact with the field personnel or laboratory to correct data deficiencies. Decisions to repeat sample collection and analyses may be made by the Barr project manager based on the extent of the deficiencies and their importance in the overall context of the project.

All data generated for the Site will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include the data flags provided by the laboratory or applied during the data review process. The data reviewer flags will indicate that the data are:

(1) useable as a quantitative concentration; (2) useable with caution as an estimated concentration (due to concentration below the reporting limits or due to potential false positive concentrations); or (3) unusable due to out-of-control QC results.

The overall completeness of the data package will also be evaluated by the Barr QA manager. Completeness checks will be administered on all data to determine whether deliverables as specified here are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, and QC summaries. The Barr QA manager will determine whether all required items are present and request copies of any missing deliverables.

5.3 Quality Control Samples

5.3.1 Trip and Field Blanks

Trip blanks pertain to volatile organic samples only. Trip blanks are prepared prior to the sampling event in the actual sample containers and are kept with the samples throughout the sampling event. They are then packaged for shipment with the other samples and sent for analysis. There should be one trip blank included in each cooler containing VOCs. At no time after their preparation are the trip blank sample containers opened before they reach the laboratory.

Field blanks are defined as samples which are obtained by running analyte-free deionized water through sample collection equipment (bailer, pump, auger, etc.) after decontamination, and placing it in the appropriate sample containers for analysis. These samples will be used to determine if decontamination procedures have been sufficient. The guidelines for including blanks in this sampling program are as follows:

- Groundwater Monitoring Wells — Field and trip blanks will be submitted at the rate of one field blank and one trip blank per sampling event.

5.3.2 Field Duplicate Samples

Duplicate samples are independent samples collected in such a manner that they are equally representative of the parameter(s) of interest at a given point in space and time. Duplicate samples, when collected, processed, and analyzed, provide intralaboratory precision information for the entire measurement system including sample acquisition, handling, shipping, storage, preparation and analysis. Duplicate samples will be submitted to the laboratory as blind or masked samples. The guidelines for including field duplicate samples in this sampling program are as follows:

- Groundwater Monitoring Wells — Field duplicate samples will be submitted at the rate of one field duplicate per sampling event.

5.3.3 Sample Identification and Transportation

Groundwater samples will be identified with a number unique to the location of the monitoring well or location. QC samples will be identified with the following prefixes followed by a sequential number:

- FB—Field Blank (FB-1)
- TB—Trip Blank (TB-1)
- M—Field (masked) Duplicate (M-1)

Samples will be delivered or shipped to the laboratory via a delivery service within 36 hours of sample collection following the SOP for the transport of samples to the laboratory.

5.4 Sample Container, Preservation and Holding Times

Table 4 provides a complete summary of project-specific sample container, preservation, and holding times.

6.0 Schedule and Reporting

Monitoring reporting will be performed annually during Tier 1 monitoring and semiannually during Tier 2 monitoring.

- Tier 1 monitoring reports will be submitted by January 30th for the previous year. NPDES semiannual reports will be submitted no later than the 21st day of the month following the period during which the monitoring event occurred.

- Tier 2 monitoring reports will be submitted semiannually no later than the 31st day of the month following the quarter during which the monitoring event occurred. The report format is shown on Figure 4. Semiannual reports will include the following: site map, groundwater elevation figure, groundwater elevation and water quality data tables, summary of the quality assurance review, figures with the Mann Kendall test results for wells PW17 and PW18, and the sentinel wells B8, B12 and W14. Mann Kendall analysis will only be performed when COC concentrations exceed their respective detection limit. Recommendations for changes and adjustments to the monitoring plan will be proposed in the report, as needed.

Tables

Table 1

Monitoring Network Summary

Sample Locations	Tier 1	Tier 2
B4	VOCs/8260	VOCs/8260
B8	VOCs/8260	VOCs/8260
B12	VOCs/8260	VOCs/8260
W13	VOCs/8260	VOCs/8260
W14	VOCs/8260	VOCs/8260
PW17	VOCs/8260	VOCs/8260
PW18	VOCs/8260	VOCs/8260
NPDES Permit Monitoring		
Outfall 20100 (Catch Basin)	Oil & Grease, TOC, pH	NA
Outfall Crocker's Creek	VOCs/8260	NA

Table 2

Monitoring Parameters and Analytical Methods

Volatile Organic Compounds SW846 Method 8260	
Parameter	**Laboratory Reporting Limit (ug/L)**
1,1-Dichloroethylene	1.0
cis-1,2-Dichloroethylene	1.0
trans-1,2-Dichloroethylene	1.0
1,1,2-Trichloroethylene (TCE)	1.0

Field Parameters		
Parameter	**Method**	**Reporting Limit**
Temperature	YSI 556 MPS	1 °F
Dissolved Oxygen	EPA Method 360.1	1 mg/L
ORP	YSI 556 MPS	0.5 mV
Specific Conductance	YSI 556 MPS	1 umhos/cm
pH	YSI 556 MPS	1 std. Unit

Table 3

MAROS Decision Matrix

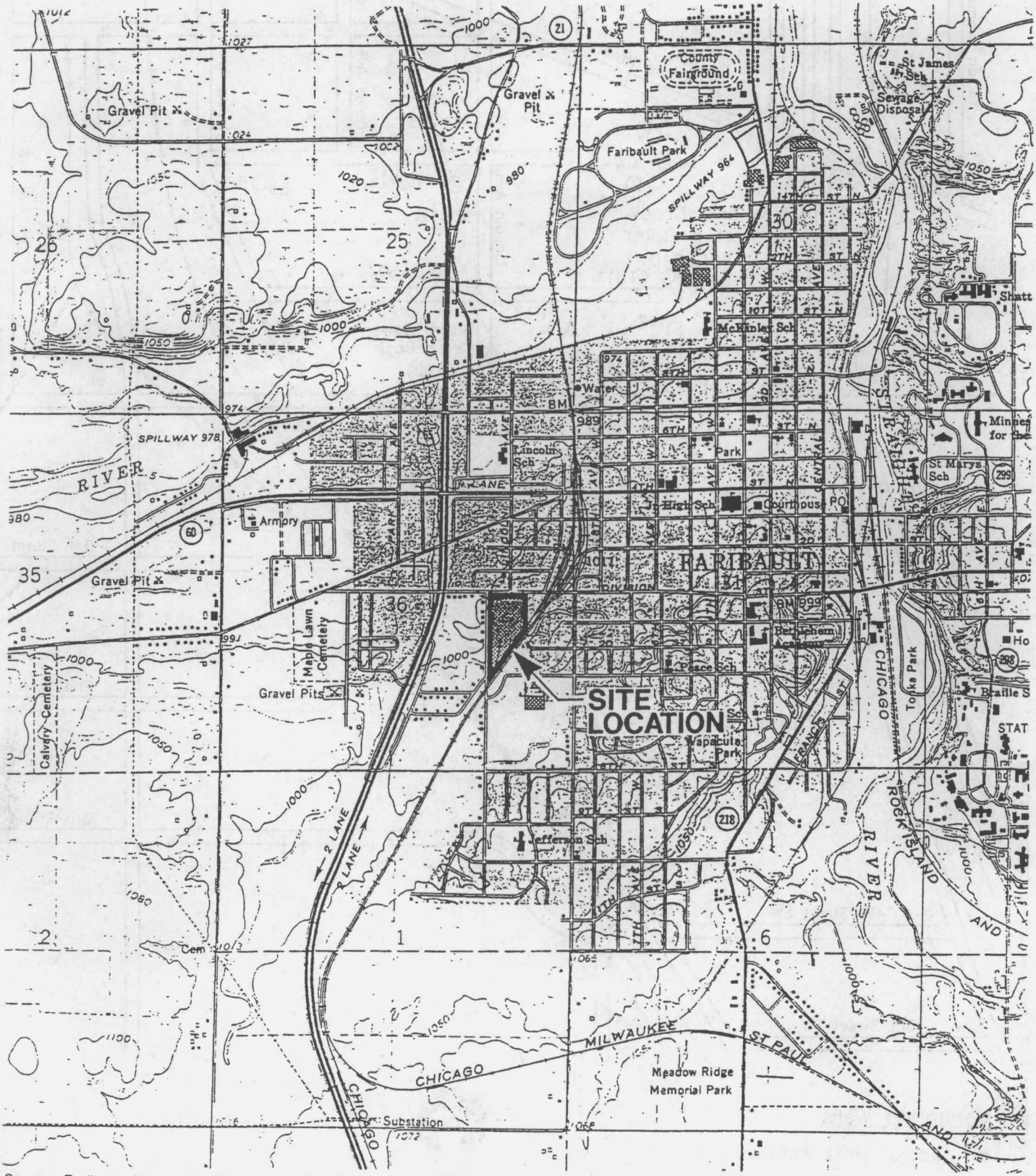
Mann-Kendall S	Confidence	Coefficient of Variance	Trend Conclusion
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Probably Increasing
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Probably Decreasing
S < 0	>95%	na	Decreasing

Table 4

Laboratory Sample Containers, Preservation and Holding Times

Parameter	Matrix	Container	Preservative	EPA Recommended Holding Time
VOCs	Water	40 ml vial	HCl to pH<2, Cool to 4°C	14 days
Total Organic Carbon	Water	Glass vial	H2SO4 to pH <2	ASAP
Oil and Grease	Water	1 liter glass	H2S04, cool to 4°C	28 days

Figures



Source: Faribault, Minnesota Quadrangle, 7.5 Minute Series, 1960

N

0 2000 4000

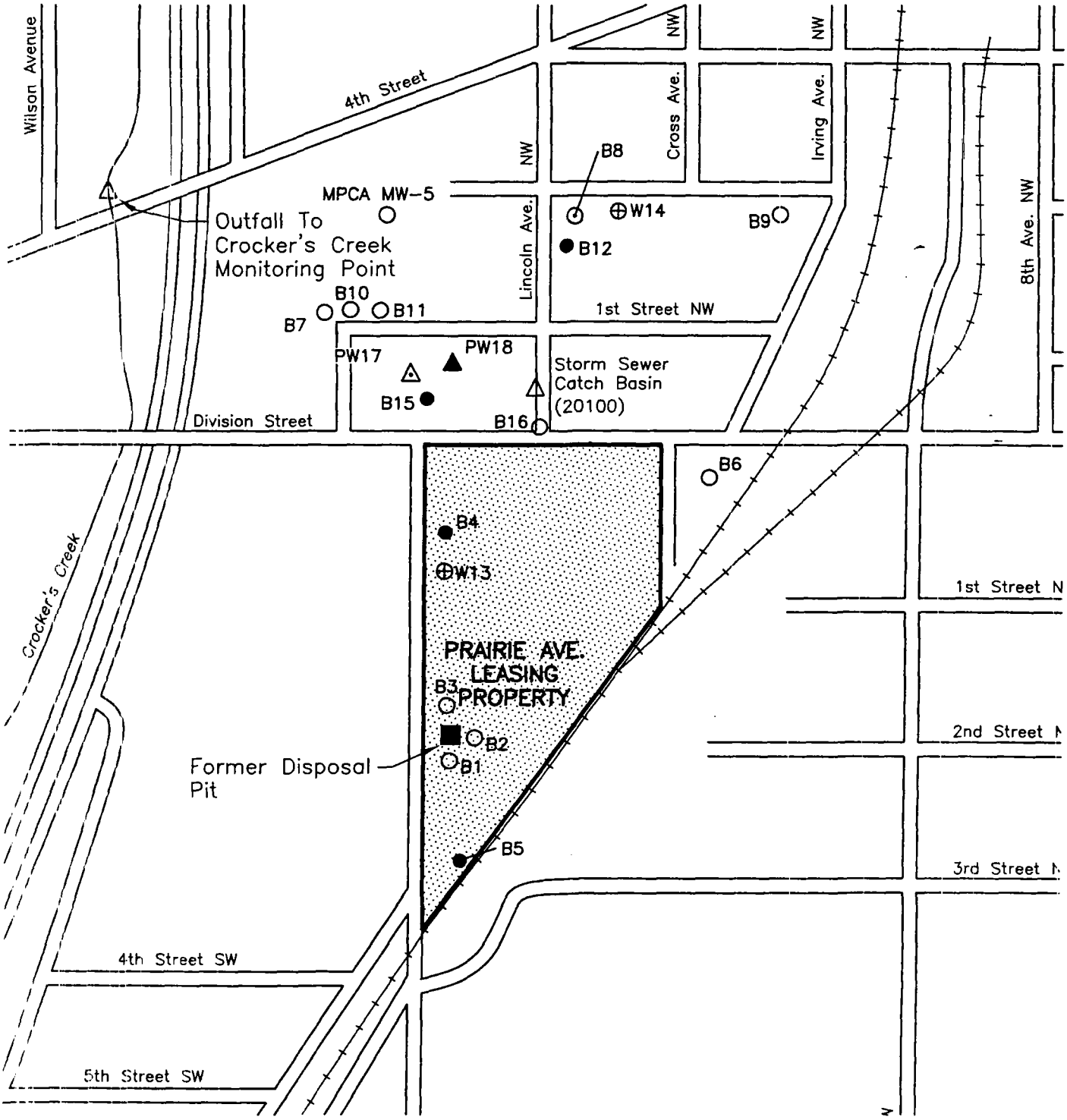
Scale in Feet

QUADRANGLE LOCATION

Figure 1

SITE LOCATION MAP

Prairie Avenue Leasing
Faribault, Minnesota



Monitoring Wells

- ● Glacial Drift Aquifer
- ⊙ St. Peter Sandstone Aquifer
- ⊕ Praire du Chien Aquifer
- ○ Sealed Monitoring Well

Pump Out Wells and NPDES Sample Locations

- ▲ Glacial Drift Aquifer
- ◬ St. Peter Drift Aquifer
- △ Surface Water Sample

0 400 800

SCALE IN FEET

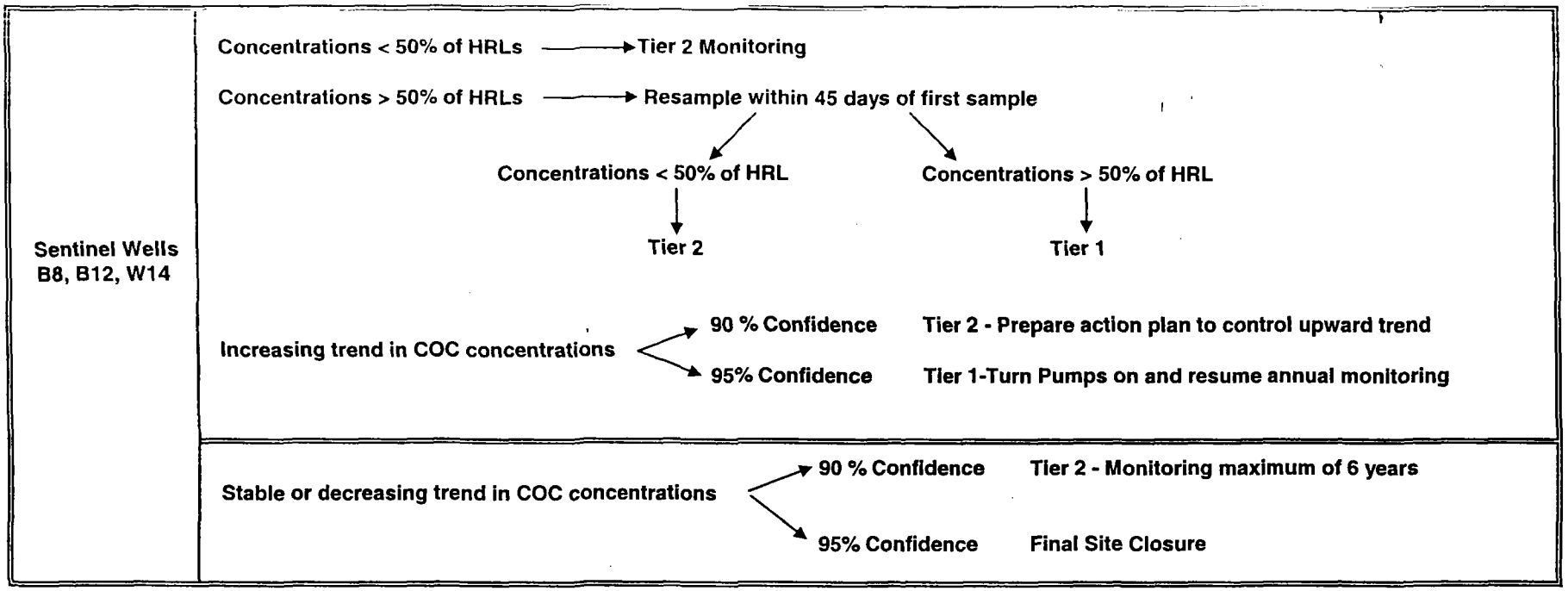
Figure 2

MONITORING LOCATIONS
MAY 2002

Nutting Truck and Caster Site
Faribault, Minnesota

jmw M:\CAD\25600\10202_1.DWG Plot at 1 04/28/2003 11:45:36

Figure 3
Contingency Plan Flow Diagram



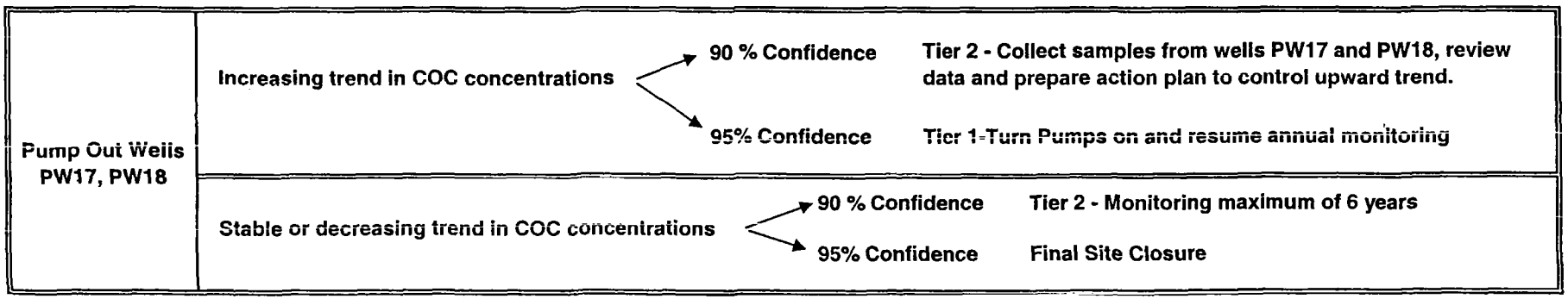


Figure 4

Tier 2 Monitoring Report Format

Nutting Truck and Caster Site
Tier 2 Groundwater Monitoring Program

Monitoring Period:
Date:

Sample Collection and Analysis Completeness:
Contingency Plan Criteria Elements Sentinel Wells B8, B12, W14 COC concentrations are less than detection limit. Yes No, explain Wells PW17 and PW18 TCE concentration trend is stable or decreasing Yes No, explain
Quality Assurance Review Duplicates: Blanks: Surrogate Recovery: Matrix Spike Duplicate Recovery: Other:
Recommendations

List of Tables:	Table 1 Groundwater Elevations Table 2 Water Quality Data (including duplicates and blanks)
List of Figures:	Figure 1 Site Map Figure 2 Groundwater Elevations Figures 3a – 3(x) Mann Kendall Test Analysis
Attachments	Attachment A Field Data Report Attachment B Laboratory Data Report

Report was prepared by:

	Date:

Appendix B

Standard Operating Procedures- Data Validation/Review

STANDARD OPERATING PROCEDURE

FOR ROUTINE LEVEL

VOLATILE ORGANIC DATA VALIDATION

Solids or Aqueous

by

EPA, 8260, 8021, 465, or GC

June 23, 1994

Revised June 22, 1995
Revised February 7, 2000

BARR ENGINEERING COMPANY

VOLATILES -solids or aqueous

I. Holding Time

CRITERIA: 14 days from collection to analysis (7 days if unpreserved for aromatics).

For TCLP: 14 days from collection to TCLP leaching, then 14 days for analysis.

ACTION: Qualify data with **h** if exceeded.

NOTES: Product samples (i.e. oils) may be held longer.

II. Blanks

CRITERIA: Qualify sample data if less than 5 or 10 times the blank concentrations. See the blank SOP or Table V-1 for specific common lab contaminants.

FREQUENCY: Lab blanks daily or every 12 hours (8260).

ACTION: Qualify data with **b** if criteria is exceeded.

NOTES: Not all laboratory contaminants will always be detected in the blanks yet may be present in the samples (such as for methylene chloride, and acetone)

Be aware of extraction blanks and analysis blanks.

Field and trip blanks may contain analytes yet the field samples are clean. The original quality of the field or trip blank water may have been the source.

III. Surrogates

CRITERIA: For 8260 (1996)(guidance limits only)

	Water	Soil
4-Bromofluorobenzene	86-115	74-121
Dibromofluoromethane	86-118	80-120
Toluene-d_8	88-110	81-117

Method 624 or MDH 465 surrogate limits not specified.

FREQUENCY: Every sample, blank, and standard

ACTION: If surrogate recovery criteria is exceeded: assign a * qualifier to detected values only when it is apparent that the data was affected. If the data agrees with historical data (and the historical data does not have similar surrogate problems) and the surrogate is out only marginally (10 % above or below the limits) no qualifiers are necessary.

If surrogate is <10%, qualify associated VOC data with * if detected, ** if non-detect unless evidence exists which proves the target parameters have not been adversely affected

IV. **Matrix Spikes**

CRITERIA: For 8260, 8021, 465: (1996) Since the acceptance criteria range listed in the methods are so wide, use the laboratory limits when provided. Generally recoveries should be in the 70%-110% range.

FREQUENCY: Every 20 samples, unless MS/MSD analyses are not required.

ACTION: If high matrix spike recovery, qualify associated VOC data with * if detected, no qualifier if non-detect.
If matrix spike recovery is < lower limit, and spiked sample was a project sample, the * qualifier may be assigned. If LCS (blank spike) is provided, check for systematic recovery problem.

NOTES: Solid samples may have highly variable concentrations of target analytes, so the % recoveries may be influenced by the sample precision.

If native sample is > 4 times spiked concentration, the spike recoveries may not be calculated.

If spiked sample is not a project sample, only qualify data if other QA information indicates a systematic problem.

If Lab Control Samples (blank spikes) recoveries are provided, it reflects the accuracy of the analysis but nothing specifically about the samples and the sample matrix effects.

If target compound list includes 2-Chloroethylvinylether it should be noted that this compound degrades in HCl. Zero percent should be qualified with an *.

MSD may not be required by the method, but good lab practices would analyze and report MS/MSD RPD approximately 20% for most samples. Samples that are of an extremely difficult matrix with very high target concentrations should be analyzed individually using professional judgement.

V. Duplicates

CRITERIA: Not specified except for single lab water % relative standard deviation data. Lab based precision limits may be reported by the labs, but project sample precision may not be controllable by sampling or analysis actions.

FREQUENCY: For 8260, one duplicate per 20 samples. Field duplicates frequency should be listed in the QAPP.

ACTION: Calculate RPDs for all data pairs above the reporting limit only. No qualifiers assigned for precision unless an abundance of evidence warrants it. Document reasons for any qualifiers assigned.

VI. Overall Assessment

Review the chain-of custody form to determine whether the laboratory report matched the analyses requested and/or the parameters listed on any table of project parameters provided to the laboratory. Also review any information concerning the sample integrity and condition as documented by the laboratory upon sample receipt. Historical data, if available, may be reviewed to look for trends in the data values. Footnotes which document additional information about the quality of the data may be assigned to data values. If the data set being reviewed/validated contains data with large changes in the data from the historical trends, contact the project manager. The project manager may request that the lab be contacted for investigation in to the reported data. Review the case narratives for any details concerning the changes in the data.

TABLE V-1

Common Volatile Laboratory Contaminants

Methylene chloride	Acetone
Toluene	2-Butanone (MEK)
Carbon disulfide	Cyclohexane

STANDARD OPERATING PROCEDURE

FOR ROUTINE LEVEL

METALS DATA VALIDATION

Solids or Aqueous

by

ICAP (200.7 or 6010) or AA (200.0 or 7000),

Mercury by 245.1/245.5 or 7470/7471.

June 23, 1994

BARR ENGINEERING COMPANY

METALS

I. Holding Time

CRITERIA: Mercury: **28** days from collection.
Other metals: **6** months.

ACTION: Qualify data with **h** if exceeded.

NOTES: Water samples preserved with nitric acid to pH 2 or less.

II. Blanks

CRITERIA: No analytes should be in any of the blanks. Use 5 x rule for positive contamination.

FREQUENCY: For ICAP: Cal. blank every 10 samples. One preparation blank per batch-no criteria.
For AA by 200 and 7000 series: (Metals & Mercury) One cal blank after each calibration.
One prep blank each digestion batch.

ACTION: Qualify data with **b** if criteria is exceeded.

NOTES: The Barr SOP for blank sample evaluation is the basis for the criteria.

III. Laboratory Control Sample (LCS)

CRITERIA: **80% to 120% for water, 70%-130% for solids.**

FREQUENCY: For method 200.0 (metals except Hg): Not specified in method.
For method 7000 (metals except Hg): One per analysis batch.

ACTION: If LCS > 120% and samples are ND, no action. If detects, qualify with *.
If LCS between 50 and 80%: Qualify data with *.
If LCS is less than 50%: Qualify data with **.

NOTES: The 80-120% is from CLP. The following specific criteria are found in the listed methods:
For method 200.0 and 7000 (metals except Hg): Not specified in method.
For method 245.1/245.5 (Hg): EPA limits for EPA blind sample.
For method 7470/7471 (Hg): 80 to 120% recoveries.

IV. Laboratory Duplicates

CRITERIA: All metals, any method: 20% (35% for soil) RPD limit for sample values greater than 10 times the IDL or reporting limit.

A difference of 1x the reporting limit (or CRDL) for water (2x for soils) samples if both sample values are <10xIDL (or reporting limit).

FREQUENCY: 5% or one per analytical batch.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **).

NOTES: The CLP criteria and method specific criteria were combined to determine the criteria listed above. (Some methods had no criteria).
The laboratory may have specific acceptance limits.

V. Field Duplicates

CRITERIA: There are no acceptance criteria for field samples.

FREQUENCY: See project QAPP for frequency.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **). No qualifiers should be assigned for precision based on field duplicates unless an abundance of evidence warrants it. Document reasons for any qualifiers assigned due to field duplicates.

VI. Matrix Spikes

CRITERIA: For all metals, all methods: 75-125% recovery.

FREQUENCY: Every 20 samples (5%) or one per batch.

ACTION: If spike recovery is > 125%: qualify all ND values with *.
If spike recovery is between 30 and 74%: qualify all data with *.
If spiked sample recovery is less than 30%: qualify all data with **.

NOTES: If native sample is > 4 times spiked concentration, the spike recovery criteria does not apply.

If spiked sample is not a project sample, only qualify data if other QA information indicates a systematic problem.

If only blank spikes recoveries are provided, it reflects the accuracy of the analysis but nothing specifically about the samples and any potential sample matrix effects.

Solid samples may have highly variable concentrations of target analytes, so the % recoveries may be influenced by the sample precision and inherent sample heterogeneity.

Post digestion blank recovery data is not to be used in place of pre-digestion data.

MSD may not be required by the method, but good lab practices would analyze and report MS/MSD RPD approximately 20% for most samples. Samples that are of an extremely difficult matrix with very high target concentrations should be analyzed individually using professional judgement.

VII. Other Method Criteria

Furnace AA: The Method of Standard Addition (MSA) is employed by the laboratory as needed. For method 200: no acceptance criteria are specified. For method 7000: the r must be $\geq$ 0.995.

CV AA (for Hg): For cold-vapor methods for mercury, the lab may also utilize the MSA. No specific acceptance criteria for method 245.1/245.5 and 7470/7471.

ACTION: If r is not greater than .995 for method 7000, qualify with * only if performed on project sample.

VIII. Overall Assessment

Review the chain-of custody form to determine whether the laboratory report matched the analyses requested and/or the parameters listed on any table of project parameters provided to the laboratory. Also review any information concerning the sample integrity and condition as documented by the laboratory upon sample receipt. Historical data, if available, may be reviewed to look for trends in the data values. Footnotes that document additional information about the quality of the data may be assigned to data values.

STANDARD OPERATING PROCEDURE

FOR ROUTINE LEVEL

GENERAL CHEMISTRY DATA VALIDATION

Solids or Aqueous

June 23, 1994

BARR ENGINEERING COMPANY

GENERAL PARAMETERS - solids or aqueous

PART 1 - General Parameters (excluding Radiochemical -see Part 2)

I. Holding Time

CRITERIA: Use EPA or method criteria.

ACTION: Qualify data with **h** if exceeded.

II. Calibration

CRITERIA: Method Specific criteria.

ACTION: Qualify data with * if criteria are exceeded.

NOTE: Calibration information may or may not be provided.

III. Blanks

CRITERIA: When evaluating the blanks for their impact on sample data, usr the following guidelines: 1) If blank samples are reported with an uncertainty interval (such as ± 2 pCi/L), use the upper end of the interval as the value to be multiplied by 5 for the X five rule. As an example if total radium in the method blank was reported as 4 ± 2 pCi/L), use 4+2 or 6 as the value to multiply

No analytes should be in the blanks (field, calibration, and preparation). Use 5 x rule.

FREQUENCY: Method specific.

ACTION: Qualify data with **b** if criteria is exceeded.

NOTES: The Barr SOP for blank sample evaluation is the basis for the action.

IV. Laboratory Control Sample (LCS)

CRITERIA: Use laboratory or method criteria.

FREQUENCY: Method specific, but one per analytical batch as a minimum.

ACTION: If LCS > upper limit and samples are ND, no action. If detects, qualify with *.

NOTES: If LCS is < the lower limit: Qualify data with *.
Use method or laboratory criteria.

LCS data may not be available from all analytical methods.

V. Laboratory Duplicates

CRITERIA: Use method or laboratory criteria.

FREQUENCY: 5% or one per analytical batch is customary.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **).

NOTES:

VI. Field Duplicates

CRITERIA: There are no acceptance criteria for field samples.

FREQUENCY: See project QAPP for frequency.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **). No qualifiers should be assigned for precision based on field duplicates unless an abundance of evidence exists.

Document reasons for any qualifiers due to field duplicates.

VII. Matrix Spikes

CRITERIA: See method or laboratory based criteria.

FREQUENCY: Every 20 samples (5%) or one per batch is customary.

ACTION: If spike recovery is > upper limit: qualify all ND values with *.

If spike recovery is < lower limit: qualify affected data with *.

NOTES: If native sample is > 4 times spiked concentration, the spike recovery criteria does not apply.

If spiked sample is not a project sample, only qualify data if other QA information indicates a systematic problem.

If only blank spikes recoveries are provided, it reflects the accuracy of the analysis but nothing specifically about the samples and any potential sample matrix effects.

Solid samples may have highly variable concentrations of target analytes, so the % recoveries may be influenced by the sample precision and inherent sample heterogeneity.

Post digestion blank recovery data is not to be used in place of pre-digestion data.

MSD may not be required by the method, but good lab practices would analyze and report MS/MSD RPD approximately 20% for most samples. Samples that are of an extremely difficult matrix with very high target concentrations should be analyzed individually using professional judgement.

VIII. Other Method Criteria

Check chain-of-custody and other documents to see if sample integrity aspects such as condition of the sample container, sample temperature upon receipt at the laboratory, and sample preservation were satisfactory. If significant deviations are found, document them on data validation form and contact the appropriate project personnel. Sample re-collection may be deemed to be necessary.

IX. Overall Assessment

Review the chain-of custody form to determine whether the laboratory report matched the analyses requested and/or the parameters listed on any table of project parameters provided to the laboratory. Also review any information concerning the sample integrity and condition as documented by the laboratory upon sample receipt. Historical data, if available, may be reviewed to look for trends in the data values. Footnotes which document additional information about the quality of the data may be assigned to data values.

PART 2 - RADIOCHEMICAL ANALYSES (Gross Alpha, Gross Beta, Total Radium)

I. Holding Time

CRITERIA: Use EPA or method criteria - 6 months.

ACTION: Qualify data with **h** if exceeded.

II. Blanks

CRITERIA: No analytes should be in the blanks (field, calibration, preparation). Use 5 x rule.

FREQUENCY: Method specific.

ACTION: Qualify data with **b** if criteria is exceeded.

NOTES: The Barr SOP for blank sample evaluation is the basis for the action.

III. Laboratory Control Sample (LCS)

CRITERIA: Use laboratory or method criteria.
FREQUENCY: Method specific, but one per analytical batch as a minimum.

ACTION: If LCS > upper limit and samples are ND, no action. If detects, qualify with *.

NOTES: If LCS is < the lower limit: Qualify data with *.
Use method or laboratory criteria.

LCS data may not be available from all analytical methods.

IV. Laboratory Duplicates

CRITERIA: *Use method or laboratory criteria.*

FREQUENCY: 5% or one per analytical batch is customary.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **).

V. Field Duplicates

CRITERIA: There are no acceptance criteria for field samples.

FREQUENCY: See project QAPP for frequency.

ACTION: Calculate RPDs for all data pairs above the reporting limit only and without the following data qualifiers: b, U, R, <, and **). No qualifiers should be assigned for precision based on field duplicates unless an abundance of evidence exists.

NOTES: Document reasons for any qualifiers due to field duplicates.

VI. Matrix Spikes

CRITERIA: See method or laboratory based criteria.

FREQUENCY: Every 20 samples (5%) or one per batch is customary.

ACTION: If spike recovery is > upper limit: qualify all ND values with *.

If spike recovery is < lower limit: qualify affected data with *.

NOTES: If native sample is > 4 times spiked concentration, the spike recovery criteria does not apply.

If spiked sample is not a project sample, only qualify data if other QA information indicates a systematic problem.

If only blank spikes recoveries are provided, it reflects the accuracy of the analysis but nothing specifically about the samples and any potential sample matrix effects.

Solid samples may have highly variable concentrations of target analytes, so the % recoveries may be influenced by the sample precision and inherent sample heterogeneity.

Post digestion blank recovery data is not to be used in place of pre-digestion data.

MSD may not be required by the method, but good lab practices would analyze and report MS/MSD RPD approximately 20% for most samples. Samples that are of an extremely difficult matrix with very high target concentrations should be analyzed individually using professional judgement.

VII. Other Method Criteria

Check chain-of-custody and other documents to see if sample integrity aspects such as condition of the sample container, sample temperature upon receipt at the laboratory, and sample preservation were satisfactory. If significant deviations are found, document them on data validation form and contact the appropriate project personnel. Sample re-collection may be deemed to be necessary.

VIII. Overall Assessment

Form to determine whether the laboratory report matched the analyses requested and/or the parameters listed on any table of project parameters provided to the laboratory. Also review any information concerning the sample integrity and condition as documented by the laboratory upon sample receipt. Historical data, if available, may be reviewed to look for trends in the data values. Footnotes which document additional information about the quality of the data may be assigned to data values.

Levels of Data Validation

I. **Minimal Level**

Consists of an overview without documentation of the QC information listed below.

- *Minimal QC check for both quality and quantity*
- *Holding times and units check*
- *"Completeness" check – Does report match the request?*
- *Blank data and masked duplicate when collected*

II. **Routine Level**

Consists of reviewing the QC data summarized by the lab without reviewing supporting raw data (i.e. chromatography). If, during the review data quality is found to be suspect, additional information may be requested from the lab and evaluated. A Routine QC Review Form will be completed. It includes validation steps of the minimal level plus:

- *Accuracy (spiked samples, control samples) to check percent recovery*
- *Precision (spiked duplicates, sample duplicates, masked duplicates) to determine the relative percent difference value*

The validation is documented by handwritten notes on the Barr blue Routine Level Form.

III. **Audit Level**

Consists of a thorough review of the above elements. Supporting new data will be requested and reviewed if initial data review indicate potential problems with the data quality. Data will be qualified as required. The validation includes the following elements:

- Method blank
- Daily calibration check standards
- Surrogate compound spike recovery (organics)
- Matrix spike and Matrix spike duplicates
- Current calibration table
- Control samples (if any)
- Sample sequence (or run log)
- ICP interference checks (metals)
- Post digestion spike (metals)
- ICP serial dilution (metals)
- Method of standard additions (metals)

The validation is documented in memo format to file and the project manager.

IV. **CLP/CLP Equivalent Level**

This is the most thorough validation. The lab report includes all required supporting documentation. If CLP methods are used, a complete CLP deliverables package will be submitted and reviewed following the EPA functional guidelines for validating data. If other methods of analysis are used, the data package and review procedures will be similar to those described in the guidance document.

Note: Barr Engineering Co. defined data qualifiers are used for all levels except CLP where EPA CLP qualifiers are used.

Laboratory Deliverables

The following sets of data and information may be required when analytical data reports are being reviewed, validated, and data quality is being determined at either the **Audit** or **CLP/CLP equivalent level**.

I. Organic Data

- Method blanks
- Daily calibration check standards
- Surrogate compound spike recovery
- Matrix spike and Matrix spike duplicates
- Current calibration table
- Laboratory control samples (if any)
- Chromatograms (samples, spikes, dups, blanks, calibration checks)
- Sample sequence (or run log)
- Current MDL study table of values
- Project specific case narrative
- Project data report

II. Metals Data

- Blanks
- Calibration standards
- Post digestion spikes
- Matrix spikes and matrix spike duplicates
- ICP interference check
- Laboratory control samples
- ICP serial dilution check
- Sample sequence (or run log)
- Current MDL study table of values
- Method of standard additions data summary
- Project specific case narrative
- Project data report

III. General Chemistry

- Blanks
- Matrix spikes and matrix duplicates
- Sample duplicates
- Laboratory control samples
- Current MDL values
- Project specific case narrative
- Project data report

Barr Engineering Operating Procedure for the Evaluation of Blank Data

(Based on the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analyses, 1994, 1999)

I. Objective

The assessment of blank analysis results is required in order to determine the existence and magnitude of contamination and to identify potential false positive sample results. The criteria for evaluation of blanks apply to any blank (field, trip, method, preparative) associated with the samples. If target analyte contamination problems exist with the blanks, all associated sample data must be carefully evaluated to determine the extent, if any, that the contaminants have affected the sample data.

II. Criteria

No target analyte contaminants should be present in the blank(s).

III. Evaluation Procedure

A. Review the results of all associated blank(s) from laboratory data summary and raw data (chromatograms, reconstructed ion chromatograms, quantitative reports, or data system printouts).

B. Verify that method blank analyses have been reported per matrix, per concentration level, for each system used to analyze volatile samples, for each extraction batch for semi-volatilizes and for each batch of metals.

IV. Action

Action in the case of contaminated blank results depends on the circumstances and origin of the blank. Positive sample results that do not exceed five times the corresponding positive blank results, ten times for common contaminants, or twenty times for SIMS, should be qualified with the letter "b" as a potential false positive value. In instances where more than one blank is associated with a given sample, qualification should be based upon a comparison with the associated blank having the highest concentration of a contaminant. The result must not be corrected by subtracting any blank value. Specific actions are as follows:

A. *If a compound is found in a blank but not found in the sample, no qualifying action is taken.* Follow-up corrective actions may be addressed with the laboratory to attempt to identify and eliminate the sources of the blank contamination whenever possible.

B. *Any compound (other than those listed below) detected in the sample which was also detected in associated blanks, mist be qualified with the letter "b" when the sample concentration is less than five times the blank concentration.* For the following compounds, the results are qualified when the sample concentration is less than 10 times (twenty times for SIMS) the blank concentration.

Common Lab Contaminants

Methylene chloride	Acetone
Toluene	2-Butanone (MEK)
Carbon disulfide	Cyclohexane

Octachlorodibenzo-p-dioxin (OCDD)

Common phthalate esters (bis-2-ethyl hexyl phthalate, di-n-octyl phthalate)

The reviewer should note that the blank analyses might not involve the same weights, volumes, or dilution factors as the associated samples. These factors must be taken into consideration when applying the 5x, 10x, and 20x criteria, such that a comparison of the total amount of contamination is actually made.

When the blank analysis does not involve the same dilution factors as the associated sample analyses, apply the 5x, 10x, or 20x criteria as follows:

1. Determine which rule (5x, 10x, or 20x) applies to the compound.
2. Multiply the reported blank value of the compound times the rule that applies.
3. Multiply the result of step 2 with the dilution factor of the relate sample.
4. Compare the sample value to the adjusted blank value (result of step 3).

Sample values less than the associated blank values must be qualified with the letter "b" in the LIMS and on tables generated from LIMS.

Also, there may be instances where contamination was not present in the associated blanks, but qualification of the sample was determined to be necessary. Contamination introduced through the use of dilution water is one example. Instances of this occurring may be detected when contaminants are found in the diluted sample result, but are absent in the undiluted sample result. Since both results are not routinely reported, it may be difficult to verify this source of contamination. However, if the reviewer determines that the concentration is from a source other than the sample, the data should be qualified. In this case the 5x, 10x, or 20x rule does not apply. The sample value should be reported as non-detect.

C. If gross contamination exists, all the compounds affected should be flagged as unusable due to interference in all the samples affected.
D. If inordinate amounts of other target compounds are found at low levels in the blank(s), it may be indicative of a problem at the laboratory and should be noted in the data review comments which are forwarded to the project manager.
E. Similar consideration should be given to tentatively identified compounds (TICs) which are found in both the sample and associated blank(s).

Barr Engineering Co. Standard Operating Procedure for the Evaluation of Field Duplicate Data

(Based in part on the USEPA Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analyses, 1988, 1999)

I. Objective

Field duplicate samples may be collected and analyzed as an indication of overall precision. These analyses measure field sampling precision, laboratory analysis precision, and sample heterogeneity. Therefore, the results may have more variability than lab duplicates, which measure only the precision of lab related analytical steps. It is expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field samples. A heterogeneous sample may result in a very high relative percent difference (RPD) which may approach 200%. Analytical sample data that are close in concentration to the reporting limits may also result in high RPDs.

II. Criteria

There are no specific review criteria for field duplicate analyses comparability found in the EPA guidelines. However, the laboratory may report advisory criteria limits for laboratory precision.

III. Evaluation Procedures

The sampling location for samples that are submitted as field duplicates should be identified using the field sampling logs. The reviewer should compare the results reported for each sample and calculate the RPD.

$$\%RPD = \frac{|D_1 - D_2|}{D_1 - D_2} \times 200$$

where: D_1 = sample result, and D_2 = duplicate sample result

Note: Do **not** calculate RPDs for data pairs from which one or both data points are reported as non-detect (< or U) or have the following qualifiers assigned: **b, **, or R**.

IV. Action

Any evaluation of the field duplicates should be provided with the reviewer's comments to the project manager.

Data Qualifiers

(Barr Engineering Co. Data Qualifiers: Used by Barr during routine and audit level data validation)

b Potential false positive value based on blank sample data validation procedures.

c Coeluting compound.

DLND Not detected, detection limit not determined.

e Estimated value, exceeded the instrument calibration range.

h EPA sample extraction or analysis holding time was exceeded.

j Reported value is less than the stated laboratory quantitation limit and is considered an estimated value.

ND Not detected or non-detect.

p Small peak in chromatogram below method detection limit (use only if the lab has reported the p).

r The presence of the compound is suspect based in the ID criteria of the retention time and relative retention time obtained from the examination of the chromatographs.

-- Not analyzed.

***** Estimated value, QA/QC criteria not met.

****** Unusable value, QA/QC criteria not met.

A project specific or unique data qualifier can be used and is designated with a number in parenthesis followed by the detailed footnote. An example is as follows:

(1) "The laboratory reported the compound identification as being suspect."

The following qualifier is used only when reporting sums of parameter groups:

a Estimated value, calculated using some or all values that are estimates.

Historical use only (not presently used):

l indeterminate value based on failure of blind duplicate data to meet quality assurance criteria.

s Potential false positive value based on statistical analysis of blank sample data.

EPA Organic Data Qualifiers

(used with CLP data by the labs)

A	The tentatively identified compound is a suspected Aldol condensation product.
B	The analyte is found in the associated blank as well as the sample. When properly validated, this qualifier is replaced with a "U" or nothing.
C	The presence of this compound was confirmed by GC/MS analysis (applies to pesticides results only).
D	Used to indicate that a dilution was necessary to bring the compound within the calibration range. The sample number is given the suffix DL.
E	For GC/MS only when the compound is outside of the calibration range.
J	Associated value is an estimate. The value is below the stated quantitaion limit.
N	Identified by a library search only, a tentatively identified compound.
P	Greater than 25 percent difference for detected concentrations between primary and confirmation GC columns. Result reported is the lower of the two values (applies to pesticide results only, use the lower value on Form 1).
R	Associated value is unusable.
U	Not detected
X	Compound concentration has been manually modified or the EPA qualifier has been manually modified or added.

BARR ENGINEERING COMPANY
ROUTINE LEVEL QUALITY CONTROL REPORT

BARR PROJECT NO.: _____ LABORATORY: _____

DATA REVIEWED BY: _____ LAB REPORT NO.: _____

DATE: _____ REPORT DATE: _____

BARR SAMPLE I.D.: REVISED REPORT DATE: _____

PAGE _____ OF _____

SAMPLE MATRIX: Soil / Water / Air

ANALYSES: VOA / Semi-VOA / Metals / Gen. Chem.

1. Holding times met: Yes / No

2. Accuracy data:
   % Recovery 75% - 125%

3. Precision data:
   RPD < 30%

4. Surrogate standards data:
   % Recovery

5. Blank data:
   See SOP

6. Completeness check:
   Compare lab report with requested analysis.

7. Masked duplicate results:
   RPD < 30%

8. Comparison with historical data:

9. Additional data qualifier added: Yes / No

10. Other actions taken:
    Contacted laboratory?
    Discussion with project manager?

11. Summary:
    Overal summary of above, such as:
    - *a discussion of qualifers added*
    - *comments on report revisions*
    - *any items which should be included in report to client*